Peri-implant disease caused by residual cement around implant-supported restorations: a clinical report

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Cement-retained restorations on implants ensures better passive fit and aesthetics, simplicity of fabrication and a homogenous load distribution during function, compared to screw-retained restorations, but it is associated to biological complications following the difficulty to remove cement excess. In fact, residual cement is a predisposing factor to peri-implant tissue inflammation and periimplantitis, because promotes plaque retention of bacteria, due to rough surface. This is especially true since radiographs should not reveal the cement excess and cements commonly used for the cementation of implant-supported prostheses have poor radiodensity. This report documents a case of clinical and radiographic findings of peri-implant disease associated with excess cement extrusion. Two months after cement removal, resolution of inflammation occurred. A good method of cementation, an accessible margin of restoration and the use of ZnOE cement instead of methacrylate cement, should help to prevent cement-related peri-implant disease.

The reality of implant restorations as well as we live it today is nothing more than the result of more experience and clinical awareness and scientific, given by an exponential increase in implants placed and a success rate often close to 100% (1)implants were placed immediately in fresh sockets. After randomization process, in group A immediate loading was performed while in group B a delayed loading protocol was followed. In both groups mean marginal bone loss was measured through intraoral digital radiographs at 3, 6, 12, 24, 36 and 48 months from loading. After a 48-month follow-up period, a success and survival rate of 96.55% was found in both groups. At 48-month follow-up, for group A a mean marginal bone loss of 0.14 ± 0.15mm was found, while for group B a value of 0.12 ± 0.12 mm was measured. No statistically significant differences between groups were found at each time point (P>0.05, also thanks to the many possibilities offered by commercial houses of implant systems. Unfortunately, all of these tools that we have available today are not able to provide for a weak point common to all the systematic: predictability in time for the behavior of peri-implant tissues or rather bone loss and consequently gingival architecture; deficits that, even in a short time, lead to a reduction of aesthetics and function, and that often frustrate the efforts of rehabilitation performed (2,3).

Implant–supported crown restorations may be retained either by retrievable screw or cement (4). The purpose of this report was to present clinical situations

Key words: implant restoration, cement excess, peri-implant diseases, peri-implant mucositis, peri-implantitis

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0393-974X (2020)

illustrating complications that may arise following the cementation of crowns on successfully osseointegrated implants. Cemented implant prostheses have become popular as a result of their relative simplicity, elimination of prosthesis screw loosening (in 50% of restorations during the first year in function) (5), improved esthetics, easier control of occlusion, and economy compared to screw-retained prostheses. This simplicity comes with a price: the possibility of leaving excess cement on the implant or in the surrounding soft tissues, which has been associated with peri-implant disease. The most likely genesis of the problem is that this cement retains microbes. In the natural dentition, subgingival cement roughness enhances plaque accumulation in the gingival sulcus, and overhanging margins of restorations change the microflora to one that is consistent with chronic periodontitis, with an increase in Gram-negative anaerobic bacteria (6).

The term ‘‘peri-implant disease’’ has been defined as ‘‘disease that affects the tissues associated with an oral implant and/or abutment. Bacteria play a major role in the etiology of peri-implant diseases, which can be restricted to soft tissue (mucositis) or progress to the supporting bone and induce its destruction (peri-implantitis) (7,8)reporting methods and study characteristics, prevalences of peri-implant diseases significantly varied in studies. This study aimed to systematically analyze implant-based and subject-based prevalences of peri-implant diseases and assess clinical variables potentially affecting the prevalence.\ nSOURCES: Electronic search of studies was conducted using MEDLINE (PubMed. Consideration must be given to the fundamental concepts of prosthodontics and restorative dentistry which are so important in the success or failure of any cemented restoration and similarly should not be overlooked in implant therapy. The purpose of this report was to present clinical situations illustrating complications that may arise following the cementation of crowns on successfully osseointegrated implants.

MATERIALS AND METHODS

Surgical procedure

The present case report was based in University of University of Chieti (Italy), in full accordance with ethical principles, including the World Medical Association Declaration of Helsinki and the additional requirements of Italian law. A 52-year-old patient (D.G.M.) was treated at the Department of Medical, Oral and Biotechnological Sciences of the University of Chieti. The subject underwent a clinical and radiological examination evidencing a bone atrophy in anterior region of premaxilla. Informed consent to the procedure was signed and the bone regeneration procedure was performed. The patient took Clavulanic (GlaxoSmithKline, UK) 2 gr/day for six days from the one prior to surgery. Disinfection of the oral cavity was achieved by rinsing with Chloroxidine digluconate at 0.2% (Curasept, Curaden Saronno, Italy). Conscious sedation was achieved by intravenous administration of benzodiazepines. After loco-regional infiltration anesthesia with Articain + Adrenaline 1/100.000 (Pierrel, Italy), a full-thickness flap of the buccal mucosa was elevated. One implant with 3.5 mm in diameter and 12 mm in length. The bone atrophy was treated with a Bone Lamina and porcine bone (OsteoBiol by Tecnoss, Italy). Finally, the flap was sutured by a 3/0 polyamide suture (Polimid, Sweden &Martina, Italy) to produce a primary healing and this was removed at 7 days from the surgery. Clinical and radiographic controls were performed before and at three months after positioned crown.

RESULTS

The implants had clinical signs of peri-implant disease and clinical, radiographic controls showed an excess cement around crow (Fig. 1). Two months after cement removal no clinical or x-ray signs of inflammation were observed.

DISCUSSION

Despite countless advances in surgical techniques and implant materials technology that contributed to make implant prosthesis a high success treatment for edentulous patients, peri-implantitis remains one of the most common cause of loss implants, affecting 9,25% of implants and 19.83% of subjects (7). The use of oral implants in complete or partially edentulous patients has undoubtedly been increased in dentistry over the past 30 years. This has also led

to different complications such as: surgical trauma, inadequate bone volume, a lack of primary stability, intrabony infection or bacterial contamination of the receptor zone, peri mucositis and peri-implantitis and occlusal overload (9), which could lead to implant failure. Pontoriero et al. in 1994 show a cause-effect relationship between bacterial plaque accumulation and the development of inflammatory changes in peri-implant soft tissues (10). The term peri-implant disease is collectively used to describe biological complication in implant dentistry, including periimplant mucositis and peri-implantitis.

The Sixth European Workshop in Periodontics held in 2017 (11) defined peri-implant diseases as a pathological condition plaque-associated occurring in tissues around dental implants, characterized by inflammation in the peri-implant mucosa and subsequent progressive loss of supporting bone (12–14). Diagnosis of peri-implant infections is based on peri-implant probing depth, evaluation of peri-implant keratinized mucosa, presence of bleeding on probing and suppuration, radiographic evaluation, evaluation of implant mobility, and analysis of peri-implant sulcus fluid (15).

The periimplant disease treatments proposed are based on the results of the treatment of periodontitis (16). Perimplantitis is supported by gram-negative anaerobic periopathogens, opportunistic pathogens, fungal organisms and viruses, that promote an inflammatory process in peri-implant soft and hard tissues and a clinically progressive crestal bone loss (17–19). Among predisposing factors to perimplantitis, in addition to pre-existing periodontitis, poor oral hygiene, diabetes, genetics and smoke, cement excess remaining after cementation of prosthetic restoration is one of the most underestimated factors, but it must be considered in the selection of connection for final restoration. The implant-crown abutment connection can be either cement or screw-retained and before choosing the connection type, it is necessary to evaluate advantages and disadvantages of each type.

Cement-retained restorations advantages are: better passivity of fit, simplicity of fabrication, lower costs, better aesthetic appearance, compensation for the discrepancies concerning dental implant position, better stress distribution on occlusal surface for the absence of the occlusal screw-access hole which usually interrupts porcelain integrity (20,21). In screw-retained connection, in fact, the screw-access hole reduces the occlusal surface, therefore fractures the porcelain (22) and loss of the abutment or crown screw occurred more frequently than in cement-retained restorations (23).The screw-retained prosthesis, however, is easier to remove in order to replace it and is indicated with diminished interocclusal space (20,21). The microgap existing at the implant-abutment connection in screw-retained restoration can favour bacterial leakage and cause inflammation of the peri-implant tissues, osteoclastic

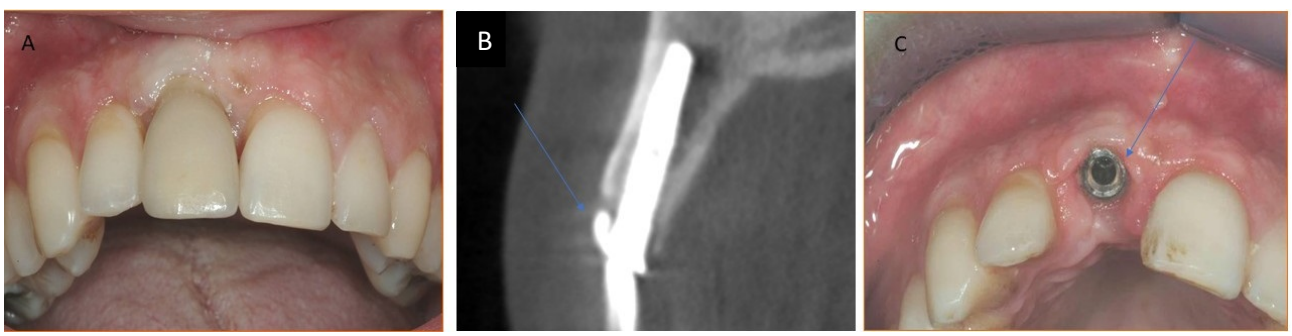

Fig. 1. ***A)****: After final prosthesis delivery;* ***B)****. Peri-implant bone loss and excess of cement (****Arrow****);* ***C)****. After prosthesis and abutment removal. The excess of cement was removed (****Arrow****).*

activation and bone resorption (24). While cemented-retained implants seems to be hermetic to bacterial infiltration because the gap is filled by cement. (25)

On the other hand, it is difficult to remove cement excess in cemented-retained system, and it can cause peri-implant soft tissue inflammation, alveolar bone resorption and the loss of the implant. Clinically, there will be bleeding during probing, increased probing depth, suppuration and fistulas (21). According to Linkevicius (26) the disease can occur from as early as 4 months to 9 years after delivery and cement-related bone loss may occur very quickly, but its severity may depend on periodontal involvement of the patient, because patients with history of periodontitis developed periimplantitis within a shorter period.

The role of residual cement in etiopathogenesis of periimplantitis is similar to that of subgingival calculus in periodontitis in natural teeth: they both act as a predisposing factor because promotes plaque retention of bacteria, due to rough surface, causing subsequent tissue inflammation. (26) It must be also considered that implant lacks of Sharpey fibers, connective tissue fibers perpendicular to tooth surface, that offer resistance to inflammatory infiltration, but connective fibers are parallel to fixture surface and make periimplant tissues less resistant to pressure that pushed cement subgengivally during cementation (21). Moreover, Linkevicius et al. (27) has shown that radiographs should not reveal the cement excess: cement remnants in palatal/lingual and facial areas are not visible, cement remnants mesially were visible in 7.5% and distally in 11.3% and deeper was position of the margin, greater amount of undetected cement was found, without considering that cements commonly used for the cementation of implant-supported prostheses have poor radiodensity (28)

Several studies in literature have shown an association between residual cement and peri-implant soft tissue inflammatory parameters and bone loss. Korsch et al. (29) examined 126 cement-retained restorations on implants: in 59.5% of the implants excess of cement was found, bleeding on probing was diagnosed at 80% of these implants and suppuration in 21.3% of the implants with excess cement. Suppuration only occurred in the presence of excess cement. The presence of residual cement raises the odds of attachment loss by 2.3 (95% confidence interval 1.1–4.9) compared with the absence of excess cement. Peri-implant attachment loss was also reported, with 62.7% of implants with excess cement exhibiting peri-implant attachment loss versus 41.2% of implants with no prior residual cement.

Wilson et al. (30) found residual cement around 81% of the implants with sulcular bleeding and/or suppuration. Four weeks after removal of the residual cement, no signs of inflammation were detectable any more in 75.7% of the cases. Linkevicius et al. (26) examined 129 implants: cement remnants were found in 56% of cases. Peri-implant disease developed in 85% of implants with cement remnants. All implants with extracoronal cement in the group of patients with history of periodontitis developed peri-implantitis and 20% of them were lost due to extensive bone loss.

Staubli et al. (31) in his review identified excess cement as a possible risk indicator for peri-implant diseases and was more frequently observed with soft tissue healing periods shorter than 4 weeks, in case of immediate loading or cementation subsequent to reentry. To reduce the risk of peri-implant disease associated with excess cement, a crown margin with a sufficient access is recommendable and soft tissue maturation should be assured. Prevalence of peri-implant diseases varied between 1.9% and 75% of the implants with cemented restorations, with proportions of 33–100% associated with excess cement. Another systematic review (32) asserted that the presence of residual subgingival cement contributes to the onset of periimplant mucositis. Clinical guidelines suggesting the use of ZnOE cement instead of methacrylate cement, with careful placement especially in patients with history of periodontitis and larger diameter implants, may reduce the risk of peri-implant mucositis.

Excess dental cement was associated with signs of peri-implant disease and bone loss. Residual cement around peri-implant tissues could be causing severe bone loss and its proper identification and removal represent the important steps toward healing.

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